UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

May 17, 1999

MEMORANDUM

SUBJECT: Transmittal of Draft Final Summary Results for Regulatory Agency Split Sampling of George AFB 1998 Groundwater Sampling

FROM: Joe Eidelberg, Chemist
Quality Assurance Office, PMD-3

THROUGH: Vance S. Fong, P.E., Manager
Quality Assurance Office, PMD-3

TO: James Chang, Remedial Project Manager
Air Force & DOE Section, SFD-8-1

This memorandum transmits summary results for the joint EPA and California Regional Water Quality Board oversight sampling results. The data was collected in accordance with the document *Quality Assurance Oversight Plan for George AFB, California, October to November 1998 Air Force Sampling Event*, prepared by the EPA Region 9 Quality Assurance Office, and approved on October 16, 1998. The results are presented in varying detail, depending on the importance of the analyte and the significance of the results, in the attachment to this memorandum. In addition, several recommendations for future sampling efforts are given. The attached summary report shall be made final once the OU-2 results for George Air Force Base (GAFB) have been submitted to the regulatory Agencies for review.

It should be noted that EPA appreciates the cooperation of the Air Force, especially Mr. Harold Reid, acting Base Environmental Coordinator, and Dr. Ralph (Bill) Kessler, George AFB Quality Assurance Officer. Further, Mr. Jehiel Cass, as well as several other members of the Lahontan Regional Water Quality Board, made this effort possible by invaluable technical and logistical support.

Results for OU-1 and OU-3 were available for review at the time this memorandum was written and data from this operable units were evaluated as appropriate in the attached report. The results were submitted in the document *Basewide Groundwater Monitoring Report, Operable Units 1 and 3, October 1998 Event*, dated April 1999, and prepared by Montgomery Watson (MW).

Please note that the results for NZ-74 were not summarized in the MW report, neither in the data reduction tables nor in the text, although the well was sampled by GAFB. In addition, it is not clear why NZ-58 had a reported result for perchlorate of < 8 µg/L, while GAFB had committed to measuring perchlorate to as low as 4 µg/L. EPA had also measured NZ-58 for perchlorate and found no matrix interferences, hence, the raised detection limit reported by MW should be explained in the MW report.

Please note that the tert-Butyl methyl ether result for NZ-72 was not reported, neither in the data reduction tables, nor in the text, although the well was sampled by GAFB.

It is recommended that GAFB review all data for groundwater samples in the general area from MW-49 to NZ-59 for low level chloroform trends. The regulatory agencies have found consistent low level detections of chloroform in split samples which have a distribution and occurrence which does not support laboratory contamination.

The Quality Assurance Office looks forward to receiving the OU-2 data report the October 1998 sampling event. The attached report will finalized after the OU-2 report has been received.

If you should have any questions concerning this transmittal, please do not hesitate to call me at (415) 744-1527.

Attachment

cc: Jehiel Cass, California Regional Water Quality Board
Harold Reid, GAFB Base Environmental Coordinator
Stephen Niou, URS-Greiner
Region 9 QA Office File
Region 9 QA Office George AFB File

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Attachment: Summary Results and Narrative of Oversight Sampling Data

1. Overview

This report describes the data generated by a joint effort of the state of California Regional Water Quality Board and the United States Environmental Protection Agency (USEPA) Region IX with the cooperation of George AFB and the Air Force Center of Environmental Excellence. The data are presented by groups related to common associated quality assurance samples. Each group of data is referred to as a scheduled event. This report does not evaluate the results obtained by the Air Force for OU-2 as the data report had not been submitted to the regulatory Agencies as of the date of this report.

This oversight effort had a broad spectrum of goals to ensure that adequate data quality is being generated at George AFB. Specifically, the goals were:

one, to determine if the depth of the sampling would signifcantly change results and hence effect the estimated mass of contaminant by using a verticle profiling sampling method;

two, to independently corroborate previous Air Force results for dieldrin in groundwater;

three, to investigate whether the appropriate definition of TPH has been applied and is useful for cleanup goals; and

four, to independently verify the accuracy of data generated by the Air Force for a variety of analytes in groundwater.

It should be noted that a critical aspect of this oversight effort was the field audit which was performed by the EPA Region 9 Laboratory and a report was generated in a separate memorandum and will not be discussed here.

This oversight effort generated high quality data for comparison against the Air Force results. No laboratory problems were noted during the data review. However, sampling problems were encountered with the vertical profiling effort which severely limited the quantity of data for interpretation. Hence, the vertical profiling data is considered of limited value and only the results are presented in this transmital.

The level of description of the quality of data is commensurate with the significance of the results or the general importance of the analytes. In this regard, the ethylene dibromide, pesticide, and volatile organic analytes have extensive QA descriptions.

The results of the analyses are presented below.

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2. Recommendations

Recommendation #1. It is recommended that George AFB, in a future sampling round, perform varied tests on a few samples high (greater than about 10 mg/L in water) to determine if appropriate analytical method defined TPH levels are appropriate for cleanup goals. The rationale for this is that there have been some questions raised about the range of compounds measured by the method defined ranges (e.g. C6 to C26, etc.) and extraction method (solvent extraction or purge). This problem arose because while the Record of Decision (ROD) states a cleanup level for TPH, the ROD does not define or give guidance for this contaminant.

Recommendation #2. It is recommended that George AFB gather the necessary data to support the flow rates used to sample groundwater for volatiles is producing acceptable data quality. The rationale for this recommendation is that historically contractors performing work for George AFB have used flow rates as much as a few gallons per minute while EPA recommends a much lower flow rate of 0.1 L per minute as optimal. In the November 1998 sampling round, George AFB contractors attempted to sample at rates closer to the EPA recommendation, however, there were varied results. Given the long history of this issue being of concern and the fact EPA could not independently verify the accuracy of the data, a simple experiment of subsituting a rented pump that is capable of sampling at the recommended flow rate of 0.1 L/min. and sampling using the normally used pump to determine if results differ signficantly would be. This effort would not be an all comprehensive effort. Given that EPA has strong interest in obtaining this Quality Assurance data, it is recommended that EPA work with George AFB and treat the samples obtained as oversight samples and EPA analyze and interpret the results.

Recommendation #3. Split sampling confirmed the presence of dieldrin in groundwater at GAFB. In addition, an independent sampling method was used (USGS SPMD samplers) to measure at extremely low levels. Given that dieldrin has now been positively identified, it is recommended that George AFB and the regulatory Agencies jointly resolve whether there will be any further investigation of possible sources or monitoring of dieldrin.

Recommendation #4. The regulatory agencies and GAFB should evaluate whether ethylene dibromide should be added as an analyte for monitoring.

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Scheduled Event #1 (VOAs in Groundwater)

Table 1.1 Summary of Sampling Event

	Sampling Date		Number of Samples	
	Planned	Actual	Planned	Actual
MW-49	19 Oct 98	21 Oct 98	1	1
NZ-72	20 Oct 98	21Oct 98	1	1
NZ-59	21 Oct 98	22 Oct 98	7	7

The samples were analyzed by EPA Method 8260A and the raw data is available in a data package title *Project: QAO-98-16A, Data Validation Package for EPA Method 8260A* which was prepared by Agricultural Priority Pollutants Laboratory. The target analyte list for Method 8260A included tert-Butyl methyl ether (MTBE).

A summary of the analytical results is provided in Table 1.2 below. The only detected analyte was TCE in sample MW-49. The GAFB data for NZ-59 are consistent with the results presented in Table 1.2. The results for NZ-72 were not presented in the MW report tables. The results for MW-49 have not been presented to the regulatory agencies for review at the time this report was prepared.

Table 1.2 Summary Results for Target Analytes

Sampling Location	Analytical Results (µg/L)						
	MTBE	Benzene	Toluene	Ethyl-benzene	Xylenes	TCE	PCE
MW-49	< 1	< 1	< 1	<1	< 1	**30**	< 1
NZ-72	< 1	< 1	< 1	< 1	< 1	< 1	< 1
NZ-59	< 1	< 1	< 1	< 1	< 1	<1	< 1

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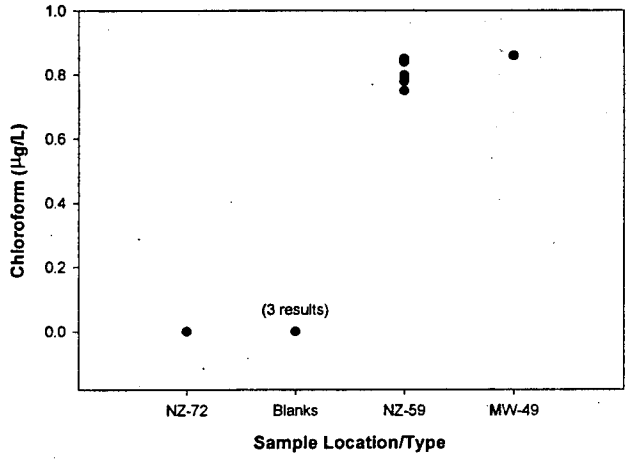
An interesting result was found in that data clearly shows chloroform present in the samples from GAFB that is not likely from laboratory contamination. The data are summarized graphically to the right in Graph 1.1. The results of eight measurements of eight different aliquots of NZ-59 and one measurement of MW-49 show surprising agreement. In contrast, the results of another sample NZ-72, which is remote from NZ-59 and MW-49, and three field blanks show no detected chloroform. The pattern of results is neither consistent with random laboratory contamination, nor field contamination of the samples. However, the GAFB reported result for NZ-59 is no chloroform detected at 0.3 µg/L, which is not consistent with the regulatory agency results. It will probably take another split sampling event with more controls to resolve this issue.

Graph 1.1 Graphical Presentation of Chloroform Results *



* Blanks is composed of the results of two trip blanks and one equipment blank. NZ-59 is composed of seven different sample analyses and one PE sample prepared from NZ-59.

A double-blind PE sample that was prepared at the Lahontan Regional Water Quality Board Laboratory which is approximately 5 miles from the sampling site at GAFB. The PE, labeled as sample NZ-126, was prepared using aliquots of NZ-59 which were spiked with 5 µL of ERA Volatiles standard solution (Lot# 3225) per 100 mL of NZ-59 water. The NZ-59 water was obtained from extra NZ-59 VOA vials that were taken when the NZ-59 was taken. The spiked solution was brought to volume in a 100 mL Class A volumetric flask. The results are presented in Table 1.3 below to support the quality of the regulatory agency data. All of the data show good recoveries, except for xylene.

While chloroform was not a spiked compound in the PE, it was presented to show the consistency of the chloroform results for NZ-59 and to preclude any questions whether chloroform was one of the fortification chemicals.

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Table 1.3 Summary of EPA Region 9 QA Office Double-Blind PE Sample Results

Analyte	BG µg/L	F µg/L	NZ126 Results	
			SSR	% R
Trichloroethene	<1	10.7	8.4	78.5
Benzene	< 1	7.06	5.5	77.9
Toluene	< 1	3.77	3.1	82.2
Ethylbenzene	< 1	11.3	9.3	82.3
Xylene (Total)	< 1	13.1	7.3	55.7
1,1,1-Trichloroethane	< 1	14.9	12	80.5
Tetrachloroethene	< 1	7.87	8.4	107
Chloroform	0.75	0	0.78	**

* BG is concentration of analyte in unfortified matrix; SSR is spiked sample analytical result in µg/L; % R is percent recovery of fortification

** Chloroform while not spiked into the PE sample is listed to preclude questions whether this was covered by the scope of analytes in the PE sample.

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Scheduled Event #2 (Perchlorate in Groundwater)

Table 2.1 Summary of Sampling Event

Sampling Location	Sampling Date		Number of Samples	
	Planned	Actual	Planned	Actual
NZ-74	20 Oct 98	21 Oct 98	3	3
NZ-58	19 Oct 98	20 Oct 98	3	3

The results of all regulatory agency split samples for perchlorate were < 1 µg/L. MW reported results of < 8.0 µg/L for NZ-58 and a field duplicate of NZ-58. Perchlorate was not measured in NZ-74 by GAFB. The MW perchlorate result for NZ-58 is considered to be in agreement with the regulatory Agency result. However, it not clear why MW was unable to meet the agreed upon reporting limit of 4 µg/L, especially since the regulatory agencies found no matrix interference with this sample.

The samples were analyzed by the regulatory agencies for perchlorate anion using a modifed USEPA method 300. At the time of sampling there was limited information available about the quality of the perchlorate method. Most of the information, including holding times and method ruggedness, was developed by one party. Given this and that EPA chose to make a modification to the then current state of California method, five double-blind PE samples were sent to the laboratory to support the quality of the GAFB results. A modification was made to lower the detection limit by a factor of at least five over the California method. (A lower detection limit was deemed prudent as there was active discussion of lowering the draft drinking water maximum contaminant level for perchlorate from 18 ug/L and it provided the regulatory Agencies better quality data necessary to evaluate any possible low level Air Force results.)

A consensus holding time for perchlorate could not be found although limited holding time studies had been performed by the state of California Department of Toxic Substances showed holding times of at least a few months. These studies were limited but gave only presumptive evidence of the GAFB holding time of 14 days. This was further supported by the chemical properties of perchlorate which is thermodynamically unstable, but kinetically stable without a catalyst. However, it was deemed reasonable to prove the quality of the data by performing a limited validation using five PE samples. (Note that the GAFB samples were combined with a split samples from MCAS El Toro taken during the same week and both sample sets were associated with these five PE samples. The PE samples were designed to test for possible effects related to concentration and matrix and also to validate the holding times to the time the samples were analyzed. The PE samples were prepared by field spiking aliquots of GAFB

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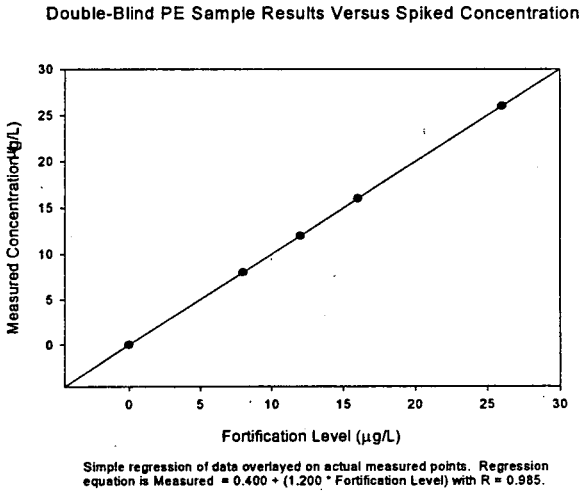
groundwater with a certified standard solution.)



The double-blind PE sample results are presented in the graph below to support the data quality generated by the regulatory agencies. The graph displayed to the right depicts measured perchlorate results for the double-blind PE samples against the perchlorate fornication level. The results support that the GAFB perchlorate data was not biased due to matrix effects or holding time at concentrations of interest. The extrapolated concentration of perchlorate in the unfortified sample is 0.4 ug/L which is not statistically different from zero. All of the spiked concentrations show excellent recovery indicating the lack of matrix interference and no time effect on stability since the samples were taken and spiked until the time of analysis. The PE samples were prepared by spiking 100 mL aliquots of groundwater from NZ-58 with a certified solution of perchlorate..

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Scheduled Event #3 (Pesticides in Groundwater)

Table 3.1 Summary of Sampling Event

Sampling Location	Sampling Date		Number of Samples	
	Planned	Actual	Planned	Actual
NZ-63	21 Oct 98	3 Nov 98	1	2
NZ-66	21 Oct 98	3 Nov 98	7	4

The regulatory agency results for split samples of NZ-63 and NZ-66 were 0.092 and 0.12 µg/L, respectively. GAFB reported results of 0.09 and 0.1 µg/L, respectively, for NZ-63 and NZ-66. The GAFB results are in good agreement with the regulatory agency results. The regulatory agency results used for this review are an average of all valid results presented in Table 3.2 below.

The samples were analyzed by the EPA Contract Laboratory Program and the raw data is available as Case # 26592, SDG# YZ497. The samples were analyzed by MITKEM Corporation.

Table 3.2 Correspondence of Various Sample Nomenclature for Scheduled Event 3 Samples and Associated QA samples with Corresponding Dieldrin Results

CLP Sample Number	COC Station Location	Actual Station Location	Dieldrin Result (µg/L)
YZ497	NZ-63	NZ-63	0.096
YZ498	NZ-103	NZ-63	0.088
YZ499	NZ-104	Equipment Blank	< 0.020
YZ500	NZ-66	NZ-66	0.10
YZ501	NZ-109	NZ-66	0.13
YZ502	NZ-110	NZ-66	0.12
YZ503	NZ-111	NZ-66	no result*
YZ504	NZ-112	NZ-66	0.13
YZ505	NZ-113	PE Sample	0.66
YZ506	NZ-114	PE Sample	2.8

* Both of the two sample YZ503 bottles were broken upon arrival and were not processed.

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Samples YZ505 and YZ506 were double-blind PE samples that were prepared by the EPA Region 9 Quality Assurance Office in field. The samples were prepared by spiking extra aliquots of NZ-66 water with a known aliquots of a standard spiking solution. YZ505 and YZ506 were prepared by spiking 200 µL and 1000 µL, respectively, of ERA Catalog# 713, Lot #580 Pesticide Standard per liter of NZ-66 groundwater. Glass class A volumetric flasks were used to bring the PE samples to volume.

Table 3.3 below provides PE accuracy results for YZ505 and YZ506. The dieldrin results indicate good accuracy. Results for two other pesticides were also included to illustrate that the laboratory produced accurate data for other pesticides.

Table 3.3 Summary of EPA Region 9 QA Office Double-Blind PE Sample Results

Analyte	BG µg/L	F µg/L	YZ505 Results		F µg/L	YZ506 Results	
			SSR	% R		SSR	% R
Dieldrin	0.12	0.69	0.74	90	3.44	4.1	116
alpha-BHC	< 0.010	0.62	0.47	76	3.12	3.2	102
4,4'-DDT	< 0.020	1.36	1.2	88	6.82	7.6	111

* BG is concentration of analyte in unfortified matrix; SSR is spiked sample analytical result in µg/L; % R is percent recovery of fortification. Dieldrin BG used was the average of the four valid results.

Scheduled Event #4 (VOAs in Groundwater)

Table 4.1 Summary of Sampling Event

Sampling Location	Sampling Date		Number of Samples	
	Planned	Actual	Planned	Actual
Boring 1	2 Nov 98	5 Nov 98	24	3
Boring 2	3 Nov 98	6-7 Nov 98	24	2

This sampling effort fell well short of planned goals in terms of number of samples. Numerous factors contributed including equipment failure, unexpected geology, inappropriate sampling apparatus design for site conditions, low aquifer yield in encountered geology compound by sampling apparatus design, and probably poor sampling locations.

The samples were analyzed by the Contract Laboratory Program using the Low Level VOA method.

Summary data of detected compounds of relevance to GAFB are provided in Table 4.2 below. No effort to interpret the data will be made. However, the results are being provided to GAFB as the data may prove of some use for future planning.

Table 4.2 Summary Analytical Results

Sample Number	Significant Results
YZ663	1 ug/L TCE
YZ664	0.6 ug/L TCE
YZ665	BTEX and TCE not detected
YZ668	2 ug/L TCE 2 ug/L Benzene 3 ug/L Tetrachloroethylene 1 ug/L Toluene 96 ug/L Total Xylenes 3 ug/L Tetrachloroethene
YZ669	4 ug/L Chloroform 3 ug/L Bromodichloromethane 0.7 ug/L Benzene 5 ug/L Toluene 2 ug/L Ethylbenzene 9 ug/L Total Xylenes

The CLP sample numbers correspond to a boring number and depth which are provided in Table 4.3 below.

Table 4.3 Summary Sample Location Information

CLP Sample Number	COC Station Location	Actual Station Location	Comment
YZ663	SP-1-134	Boring 1 – 134'	November 5, 1998
YZ664	SP-1-136	Boring 1 – 136'	November 5, 1998
YZ665	SP-1-139	Boring 1 – 139'	November 5, 1998
YZ666	SP-1-500	PE Sample	November 5, 1998
YZ667	SP-1-550	PE Sample	November 5, 1998
YZ668	SP-2-129	Boring 2 – 129'	November 6, 1998
YZ669	SP-2-141	Boring 2 – 141'	November 7, 1998
YZ670	SP-2-500	PE Sample	November 7, 1998

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Scheduled Event #5 (TPH as JP-4 in Groundwater)

Table 5.1 Summary of Scheduled Event

Sampling Location	Sampling Date		Number of Samples	
	Planned	Actual	Planned	Actual
Boring 1	2 Nov 98	5 Nov 98	13	3
Boring 2	3 Nov 98	7 Nov 98	13	2

Table 5.2 Summary of Results for Scheduled Event 5

Sample Number	Depth bgs	Actual Station Location	TPH Purgeable Result (µg/L)	TPH Extractable Result (µg/L)	
				C6-C16	C6-C28
SP-1-134	134	SP-1	< 250	1300	2100
SP-1-136	136	SP-1	< 250	< 500	710
SP-1-139	139	SP-1	< 250	560	1200
SP-2-129	129	SP-2	2200	1500	2300
SP-2-141	141	SP-2	<250	**	**

** Insufficient sample volume for analysis.

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Scheduled Event #6 (TPH as JP-4, Soil Matrix)

Table 6.1 Summary of Scheduled Event

Sampling Location	Sampling Date		Number of Samples	
	Planned	Actual	Planned	Actual
Boring 1	2 Nov 98	5 Nov 98	13	2
Boring 2	3 Nov 98	7 Nov 98	13	3

Table 6.2 Summary of Results for Scheduled Event 6

Sample Number	Depth bgs	Actual Station Location	TPH Purgeable Result (µg/L)	TPH Extractable Result (mg/kg)	
				C6-C16	C6-C28
SP-1-133	133	SP-1	**	< 15	88
SP-1-134	134	SP-1	**	< 15	81
SP-2-131	131	SP-2	**	< 15	27
SP-2-135	135	SP-2	**	< 15	< 15
SP-2-137	137	SP-2	**	20	45

** Insufficient sample volume to perform TPH purgeable analyses.

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Scheduled Event #7 (EDB, Water Matrix)

Table 7.1 Summary of Scheduled Event 7

Sampling Location	Sampling Date		Number of Samples	
	Planned	Actual	Planned	Actual
MW-45	2 Nov 98	3 Nov98	7	7

The samples were analyzed by EPA Method 504.1 and the raw data is available in a data package title *Project: QAO-98-24A, Data Validation Package for 504.1* and was prepared by Agricultural Priority Pollutants Laboratory.

GAFB results for MW-45 have not been submitted to the regulatory Agencies at the time this report was written.

The data is summarized in Table 7.1 for five discrete aliquots that were analyzed in one batch by the laboratory. The laboratory was instructed not to analyze all of the samples and hence only five results are available. The data suggests there is a trace level of ethylene dibromide (EDB) in MW-45. This was supported by second column confirmations performed by the laboratory which had a mean result of 0.025. It should be noted that the data set failed to display a pattern that was consistent with a normal distribution which may be an artifact of low instrument sensitivity. In any case, there is sufficient presumptive evidence that EDB is at trace levels in MW-45.

The quality of this data is supported by four double-blind performance evaluation samples which had acceptable recoveries. However, this set of samples did not have an equipment blank or a field blank, hence prior to making an evaluation or recommendation for further action, these results must be reviewed in conjunction with the GAFB EDB sample and blank results. However, even if EDB is discovered in the equipment blank, it would still suggest the presence of EDB in the groundwater.

The reason EPA did not split the equipment blank was that no EDB was expected in any sample hence EPA was concerned about false negatives and focused on replicate sample measurements and double-blind PE samples.

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Table 7.1 Summary Results for TCE

MW-45 EDB Data		Summary Statistics
Sample Number	Result (µg/L)	
#1	0.019	Mean 0.0192 Median 23.128
#2	0.019	Range 0.001
#3	0.019	Standard Deviation 0.00045
#4	0.020	Standard Error 0.00020
#5	0.019	Confidence Interval of Mean 0.00056
		K-S Dist. = 0.473, P = <0.001

* K-S Dist. is Kolmogorov-Smirnov, a test for normality; the results indicate that the data does not match the pattern expected if the data was drawn from a population with a normal distribution.

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Scheduled Event #8 (BTEX, MTBE, JP-4 in Groundwater)

Sampling Location	Sampling Date		Number of Samples	
	Planned	Actual	Planned	Actual
MW-46	2 Nov 98	3 Nov 98	2	2
MW-99	2 Nov 98	3 Nov 98	2	2
NZ-1	n/a	3 Nov 98	0	1
NZ-2	n/a	3 Nov 98	0	1
MW-24	n/a	4 Nov 98	0	1

The GAFB results were not available for these samples for comparison at the time this report was prepared.

Samples from MW-46 and MW-99 were analyzed using gas chromatography/mass spectrometry (USEPA Method 8260B) for BTEX with a corresponding detection limit of 5 ug/L for benzene, toluene, and ethylbenzene; and 10 ug/L for total xylene (summed concentrations of ortho-, meta-, and para- xylene.) All sample results for BTEX were not detected.

Samples from MW-46 and MW-99 were analyzed by gas chromatography/mass spectrometry (USEPA Method 8260) for MTBE with a detection limit of 5 ug/L. All sample results for MTBE were not detected.

Samples were analyzed by gas chromatography using two different integration ranges (C6 - C16 and C6-C28) in order to determine if the endpoint cutoff for the shorter range significantly changed the result. This concern was raised as it was not clear what the appropriate technical definition of TPH for George AFB should be and the C6 to C28 broadly covers what could possible be recovered. MW-46 was extracted and analyzed in triplicate and showed no significant difference, however, the level in the sample was trace. Similarly, MW-99 was extracted and analyzed in duplicate and showed marginally higher results for the wider range. However, one cannot conclude based on these results MW-24 had a result of 2.0 mg/L for the C6-C16 range, and 2.5 mg/L for the C6-C28 range. This weakly suggests that there is a measurable difference between the two ranges. It may be advisable to perform this analysis on a sample with higher TPH levels.

Samples from MW-46, MW-99, and MW-24 were analyzed by gas chromatography to determine purgeable TPH (C6-C16). The results for MW-46 and MW-99 were not

detected with a reporting limit of 250 ug/L, while MW-24 had a result of 10 ug/L.

This clearly suggests that the majority of the hydrocarbons are not amenable to purge extraction as a volatile or that the solvent extraction for TPH is coextracting material that is not of interest. Further analysis on a sample with higher TPH levels should be performed.

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Scheduled Event #9 (VOA, Methanol Preserved Soil Matrix)

Sampling Location	Sampling Date		Number of Samples	
	Planned	Actual	Planned	Actual
Boring 1	2 Nov 98	5 Nov 98	6	2
Boring 2	3 Nov 98	7 Nov 98	6	3

These samples were taken to help understand the vertical profile of contaminants at GAFB. Soil samples were taken at 133 and 134 feet bgs at SP-1, and at 131, 135, and 137 feet bgs at SP-2. All of the sample results for this event are considered rejected at this time, however, limited information about the data is provided here.

Due to various conflicting goals of on-site project personnel and technical difficulties in the field associated with collecting groundwater, the limited field time was prioritized for collection of groundwater samples thus eliminating several soil boring samples.

The samples were analyzed by EPA Method 8260A and the raw data is available in a data package title *Project: QAO-98-20A, Data Validation Package for EPA Method 8260A* and was prepared by Agricultural Priority Pollutants Laboratory.

The samples were analyzed for the target analytes benzene, toluene, trichloroethene, ortho-, meta-, and para-xylene, trichloroethene and ethylbenzene. All of the results for the target analytes were not detected at 25 µg/kg of soil which was not expected.

The methanol preservation method is not commonly used, and a private laboratory and sampling contractor unfamiliar with the technique were used. The sampling contractor failed to provide a narrative of events in preparing the samples and the laboratory failed to obtain the weight of the soil for normalizing the results. Hence, the data for this sampling event are not useable for decision making.

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Scheduled Event #10 (VOA in Groundwater)

Table 10.1 Summary of Planned and Performed Work

Sampling Location	Sampling Date		Number of Samples	
	Planned	Actual	Planned	Actual
NZ-73	5 Nov 98	4 Nov 98	7	7

10.1 Summary. The analytical results showed no detected concentrations of all target analytes except for trichloroethene (TCE). NZ-73 was determined to have an average concentration of 23.5 µg/L TCE; summary individual results and statistics are presented in Table 10.2. The MW reported result of 23 µg/L was in excellent agreement.

The data collected for this plan was in accordance with the SAP with no significant deviations. The samples were collected as split samples for comparison with Air Force results. The data were validated using the USEPA National Functional Guidelines for Organic Data Review and no issues effecting data quality were encountered. A sufficient number of QA/QC samples were included to ensure high confidence in the analytical results.

Table 10.2 Summary Results for TCE

NZ-73 TCE Data		Summary Statistics
Sample Number	Result (µg/L)	
YZ510	23.04	Mean 23.497 Median 23.128 Range 1.090 Standard Deviation 0.400 Standard Error 0.151 Confidence Interval of Mean 0.370 K-S Dist. = 0.262, P = 0.157
YZ511	23.70	
YZ512	24.00	
YZ513	23.41	
YZ655	22.91	
YZ657	23.74	
YZ658	23.70	

* K-S Dist. is Kolmogorov-Smirnov, a test for normality; the results indicate that the data matches the pattern expected if the data was drawn from a population with a normal distribution.

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10.2 Quality Assurance/Quality Control.

10.2.1 Field Negative Control Samples. A sufficient number of negative control samples to isolate possible sources of contamination were used. The VOA data for NZ-73 are associated with 2 trip blanks (YZ507 and YZ508) and 3 equipment blanks (YZ509, YZ659, andYZ660) were incorporated in the sampling and analysis. Except for methlene chloride and acetone, common laboratory contaminants, no target analyte was detected in the samples. The number of blanks used exceeded the minimum 10% frequency required by USEPA Region 9.

The high number of blanks were viewed as critical as the last groundwater sampling round performed by Montgomery Watson on behalf of the Air Force in 1997 strongly suggested poor decontamination procedures or the lack of implementation of specified decontamination procedures for the groundwater sampling effort for VOAs. In 1998 Montgomery Watson suggested that ambient air may have been the source of contamination.

As no significant blank contamination was found, this suggests that previous problems with unreliable VOA data were due to a problem not present inthe1998 sampling effort. *As the Air Force results have not yet been reviewed, final conclusions may be modified.*

10.2.2 Field Positive Control Samples. A sufficient number of PE samples were used to achieve assurance of the accuracy of the laboratory. Two PE samples were sent to the laboratory as double-blind PE samples which exceeded the USEPA Region 9 requirement of at least one per project. In addition, as part of the routine activities performed by the CLP program, two single blind PE samples were sent to the laboratory for analysis along with the George AFB samples for VOA analyses.

The two double-blind PE samples were prepared by spiking water from NZ-73 with 10 µL of a methanol standard obtained from Environmental Resource Associates. This was performed in a controlled environment at the state of California Regional Water Quality Board laboratory in Victorville, California immediately prior to sample shipment.

The summary results for the target of analytes of possible concern to George AFB and a few additional analytes representative of breadth chemical and physical properties are given in Table 10.3. The duplicate RPD results show good precision. The percent fortification recoveries are generally very good (80 to 100%) except for trichloroethene, the most important target analyte for NZ-73. The results of 58.6 and 61.1 will be used to widen the confidence interval for

comparison with the Air Force results when received.

The good spike recoveries for the broad range of target analytes fortified in the PE samples support that the majority of analytes in NZ-73 samples with not-detected results are valid, i.e. are not false negatives.

Table 10.3 Summary of EPA Region 9 QA Office Double-Blind PE Sample Results

Analyte	BG µg/L	F µg/L	YZ661 Results		YZ662 Results		Dup RPD
			SSR	% R	SSR	% R	
Trichloroethene	23.5	21.4	36.05	58.6	36.58	61.1	4.2
Benzene	< 1	14.12	11.86	84.0	12.11	85.8	2.1
Toluene	< 1	7.54	6.18	82.0	6.34	84.1	2.5
Ethylbenzene	< 1	22.6	18.26	80.8	18.79	83.1	2.8
Xylene (Total)	< 1	26.2	24.14	92.1	25.04	95.6	3.7
Vinyl Chloride	< 1	21.4	17.08	79.8	18.287	85.4	6.8
cis-1,2-Dichloroethene	< 1	28.2	24.00	85.1	24.76	87.8	3.1
trans-1,2-Dichloroethene	< 1	20.8	15.69	75.4	16.48	79.2	4.9
1,1,1-Trichloroethane	< 1	29.8	23.89	80.2	25.12	84.3	5.0
Carbon Tetrachloride	< 1	34.2	29.82	87.2	31.79	93.0	6.4
Chlorobenzene	< 1	24.2	20.86	86.2	20.98	86.7	0.6
Styrene	< 1	10.52	8.62	81.9	8.72	82.9	1.2

* BG is concentration of analyte in unfortified matrix; SSR is spiked sample analytical result in µg/L; % R is percent recovery of fortification; Dup RPD is duplicate relative percent difference.

10.2.3 Summary of analysis and data validation.

10.2.3.1 Laboratory. These samples were analyzed by MITKEM located in Warwick, Rhode Island. The samples were analyzed using the USEPA Contract Laboratory Program (CLP) and the sample results correspond to the CLP tracking numbers Case# 26592, SDGs # YZ507 and YZ514.

10.2.3.2 Analytical Method. The samples were analyzed using the USEPA CLP Low Concentration Water (OLC 02.1 Protocols). There were no deviations from the protocol that effected data quality.

10.2.3.3 Sample Tracking and Important Dates. The samples were taken on November 4,1998, mailed by UPS under airbill

1Z9576XW0142928302 on November 6, 1998, received by the laboratory on November 9, 1998, and analyzed within the 14 day technical holding time.

10.2.3.4 Data Validation. The NZ-73 sample data were validated by the USEPA Region 9 ESAT and is available as a report dated December 3, 1998, Case# 26592, Memo #1.

Table 10.4 Correspondence of Various Sample Nomenclature for Event 10 sample and associated QA samples

CLP Sample Number	COC Station Location	Actual Station Location	Comment
YZ507	TB-1104	Trip Blank	November 4, 1998
YZ508	TB-1104	Trip Blank	November 4, 1998
YZ509	EB-1104	Equipment Blank	November 4, 1998
YZ510	NZ-73	NZ-73	November 4, 1998
YZ511	NZ-74A	NZ-73	November 4, 1998
YZ512	NZ-75A	NZ-73	November 4, 1998
YZ655	NZ-77A	NZ-73	November 4, 1998
YZ656	NZ-78A	NZ-73	November 4, 1998
YZ657	NZ-79A	NZ-73	November 4, 1998
YZ658	NZ-80A	NZ-73	November 4, 1998
YZ659	NZ-81A	Equipment Blank	November 4, 1998
YZ660	NZ-82A	Equipment Blank	November 4, 1998
YZ661	NZ-90A	DBPE Sample	USEPA Region 9 QA Office
YZ662	NZ-91A	DBPE Sample	USEPA Region 9 QA Office
YZ545	n/a	PV755 CLP PE Sample	USEPA CLP Oversight
YZ546	n/a	PQ904 CLP PE Sample	USEPA CLP Oversight

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Scheduled Event #11 (Pesticides in Soil)

Sampling Location	Sampling Date		Number of Samples	
	Planned	Actual	Planned	Actual
TWA	5 Nov 98	n/a	3	0
OT-62	5 Nov 98	n/a	6	0
LF-39	5 Nov 98	n/a	6	0
Housing	5 Nov 98	n/a	9	0

This sampling event was canceled at the request of the Air Force. The Air Force agreed that levels of pesticides are probably high in areas where used, however, maintain that since the pesticides were applied legally and hence the resulting contamination is exempt from consideration under CERCLA.

Scheduled Event #12 (Pesticides in Groundwater)

Sampling Location	Sampling Date		Number of Samples	
	Planned	Actual	Planned	Actual
NZ-63	22 Oct 98	4 Nov 98	2	1
NZ-66	22 Oct 98	4 Nov 98	2	2

The results for the SPMD samplers showed good agreement with the laboratory results. The data description will be provided in the final report.